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Original Research

Sexual satisfaction and dysfunction in transgender adults following puberty suppression treatment during adolescence

Isabelle S. van der Meulen, MD[1,2,*], Marijn Arnoldussen, MD[1,2], Anna I.R. van der Miesen, MD, PhD[1,2], Sabine E. Hannema, MD, PhD[2,3], Thomas D. Steensma, PhD[2,4], Annelou L.C. de Vries, MD, PhD[1,2], Baudewijntje P.C. Kreukels, PhD[2,4]

[1]Department of Child and Adolescent Psychiatry, Amsterdam University Medical Center, 1081 HV Amsterdam, The Netherlands
[2]Center of Expertise on Gender Dysphoria, Amsterdam University Medical Center, 1081 HV Amsterdam, The Netherlands
[3]Department of Pediatric Endocrinology, Amsterdam University Medical Center, 1081 HV Amsterdam, The Netherlands
[4]Department of Medical Psychology, Amsterdam University Medical Center, 1081 HV Amsterdam, The Netherlands

*Corresponding author: Center of Expertise on Gender Dysphoria (PK-1Z-179), Amsterdam University Medical Center, 1007 MB Amsterdam, The Netherlands. Email: i.vandermeulen@amsterdamumc.nl

Abstract

Background: Sexual satisfaction and dysfunction in transgender and gender-diverse (TGD) individuals following treatment with puberty suppression (PS) have not yet been studied and remain a topic of clinical and academic concerns.
Aim: This study explores the long-term effects of (early) PS treatment on sexual satisfaction and dysfunction in TGD individuals.
Methods: This retrospective cohort study included 50 transmasculine and 20 transfeminine individuals treated with PS and gender-affirming hormones (GAH). Fifty-seven percent underwent genital gender-affirming surgery. All gender-related medical treatment (GRMT) was performed at the Center of Expertise on Gender Dysphoria in Amsterdam, the Netherlands, between 1998 and 2011. PS treatment was, on average, initiated 14 years prior to study participation. Sexual experiences were assessed using a self-developed questionnaire at least 9 years after GAH and compared between early and late PS treatment groups. Findings were compared with data of a transgender cohort that started GRMT at an adult age.
Outcomes: The primary outcomes included sexual satisfaction and various sexual dysfunctions, defined as the presence of a sexual problem accompanied by distress.
Results: Sexual satisfaction was reported by 52% of transmasculine and 40% of transfeminine individuals, with similar outcomes between early and late PS groups. Among transmasculine individuals, 58% reported at least one sexual dysfunction, most commonly difficulty with initiating sexual contact (34%), with similar frequencies in PS groups. In transfeminine individuals, 50% experienced at least one sexual dysfunction, with difficulty achieving orgasm (35%) being most common, with similar reports across PS groups. The prevalence of sexual dysfunctions was comparable to that of transgender individuals who began GRMT in adulthood.
Clinical Implications: These findings enable healthcare professionals to provide accurate and personalized information regarding the anticipated effects of early endocrine GRMT.
Strengths and Limitations: This is the first study to assess sexual satisfaction and dysfunction in TGD individuals treated with early and late PS. The small sample size precluded inferential statistical analyses.
Conclusion: In this study, the majority of transgender individuals treated with PS did not experience difficulties with desire, arousal, or achieving orgasm in adulthood. Outcomes were similar for early and late PS treatment and comparable to previous findings in those who started GRMT in adulthood. Sexual satisfaction is comparable to the general population. These results may alleviate concerns about long-term effects on sexual satisfaction and dysfunction in TGD individuals who do not undergo (full) endogenous puberty. However, attention for sexual counseling and exploration of factors that influence sexual wellbeing remains essential.

Keywords: gender-affirming care; puberty suppression; sexual satisfaction; sexual dysfunction.

Introduction

Several studies in transgender and gender-diverse (TGD) individuals have assessed sexual functioning, often as part of an evaluation of gender-affirming hormone treatment (GAHT) and gender-affirming surgeries (GASs).[1-3] Research on sexual functioning after gender-related medical treatment (GRMT) has primarily focused on individuals who began GRMT in adulthood, with limited studies on TGD individuals treated with gonadotropin-releasing hormone agonists (GnRHas) for puberty suppression (PS).[4] PS has been available to Dutch transgender minors since approximately the year 2000 and aims to prevent the development of irreversible and undesired secondary sexual characteristics associated with endogenous puberty (e.g., breast development or genital growth), which in some studies has been shown to improve psychological wellbeing.[5,6] Additionally, PS provides time for individuals to

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explore their gender identity and treatment preferences before progressing to further GRMT.[7-10]

Questions have been raised about the effects of PS on the sexual development of TGD individuals. Some fear that the absence of endogenous puberty may negatively impact their sexual functioning in adulthood,[11,12] including the capacity to experience the different stages of the sexual response cycle (i.e., desire, arousal, and orgasm).[13] The pubertal stage at the initiation of PS treatment may hold relevance, as the extent to which individuals have experienced endogenous puberty could influence later sexual functioning. GnRHas inhibit sex steroid exposure of genitalia, which are highly sensitive to androgens during the typical pubertal timeframe.[4,14] Interference through GnRHa affects genital growth and development during a possibly critical period, with potential effects on subsequent sexual function.[4] Treatment with PS might also have psychosocial implications for sexual development, as studies found that TGD youth treated with PS have less experience with all types of sexual activities compared to their cisgender peers and often wait with sexual activities (e.g., masturbation and sexual intercourse) until after completing GRMT.[15,16]

Sexual wellbeing encompasses sexual functioning, sexual relationships, and sexual satisfaction.[17] Many studies investigating sexual wellbeing in TGD individuals focus on the functioning of genitalia or aesthetic outcomes.[18,19] Sexual satisfaction is generally studied after genital gender-affirming surgery (gGAS) but not yet after treatment with PS. Before gGAS, about half of TGD individuals report dissatisfaction with their sex life.[20] Treatment with GAH, low negative feelings, and having a partner are related to a higher sexual quality of life (QoL).[20] The majority of TGD persons report improved sexual functioning and satisfaction after gGAS.[1,2,21,22] Knowledge of sexual satisfaction in post-operative transmasculine individuals is limited, as research primarily focuses on sexual activity and function, with satisfaction levels varying widely across studies.[2,23] After gGAS, 77% of transfeminine women who went through full puberty reported sexual satisfaction.[1] Most transgender young adults treated with PS and GAH value sex as moderately to very important and report being moderately to very satisfied with their sex life in general.[15]

Studying sexual (dys)function is of particular importance as this can influence sexual satisfaction.[24,25] Kerckhof et al. assessed sexual dysfunctions in transgender adults and found a higher prevalence of sexual dysfunctions in TGD individuals with less gender-related medical interventions.[26] In transmasculine individuals who received PS, low levels of oestrogen and suppressed production of ovarian androgens may have affected genital function through decreased genital growth, sensory perception, and reduced clitoral blood flow and may result in pain because of vulvovaginal dryness.[27] More than half of sexually active transgender men who started GRMT in adulthood reported at least one sexual dysfunction, with difficulty in seeking and initiating contact being the most common.[26] In transfeminine individuals, the suppression of testosterone since early puberty also limits genital growth,[28] and continued androgen suppression into adulthood, or a gonadectomy, may cause decreased genital sensation, sexual desire, and sexual pleasure.[21,27] In sexually active transgender women without PS, 69% experienced at least one sexual dysfunction after GAHT and gGAS, with difficulties achieving orgasm, pain during sexual intercourse, and difficulties initiating and seeking sexual contact being reported the most.[26] In transfeminine individuals treated with PS, 67% experienced one or more sexual problems in the last 6 months, with pain during intercourse being the most common.[29]

Evaluation of long-term outcomes on sexual satisfaction and sexual dysfunctions after GRMT including PS is essential, as sexual experiences often begin after (partial) completion of treatment. We aim to describe sexual satisfaction and sexual dysfunctions in TGD individuals with different starting points for PS treatment (early in puberty (limited endogenous puberty) and late in puberty (partial endogenous puberty)), and GRMT started in adulthood (full endogenous puberty). As genital development is halted by PS, it is hypothesized that TGD individuals treated with PS in early puberty will report lower rates of sexual satisfaction and more sexual dysfunctions than those treated with late PS or started GRMT in adulthood.[4,11,12]

Methods

Participants and procedure

This was a retrospective cohort study conducted at the Center of Expertise on Gender Dysphoria (CEGD) at the Amsterdam University Medical Center, location VUmc, Amsterdam, the Netherlands from December 2019 to March 2022. Participants were eligible if they had started PS before the age of 18 years and had their first appointment at the CEGD before 2011. Eligibility for puberty suppression required individuals to have reached at least Tanner stage G/B2. During a physical examination at initiation of PS, pubertal stage was assessed according to Tanner by a paediatric endocrinologist.[14] Tanner breast/genital (B/G) stages 2/3 were considered early pubertal stages and Tanner stages 4/5 late pubertal stages. All started PS between 1998 and 2011, had received GAHT for at least 9 years, and some had breast surgery (mastectomy or breast augmentation) or gGAS.

Potential participants were first approached by mail or email and subsequently approached by telephone. When interested, participants were invited to complete an online survey after providing informed consent. As shown in Figure 1, 89 of 145 potential participants agreed to participate in this study, and, ultimately, 70 were included (response rate: 48%). The 70 participants were compared with the 75 non-participants on birth-assigned sex, age at start with PS, and age at start of GAHT. Table 1 shows that there were significantly more transmasculine individuals among the participants (71%) versus the non-participants (37%). The ages at which PS and GAHT were started did not differ significantly between participants and non-participants.

The medical ethics committee approved the study and determined that the Medical Research Involving Human Subjects Act did not apply to this data collection (protocol number 2018.590).

Measures

This study was part of a larger multidisciplinary retrospective cohort study, consisting of a survey that included several validated questionnaires and self-developed questions about demographics, gender identity, reflections on adolescent GRMT, sexuality, and fertility. Feedback on the survey from 2 TGD individuals who received care at the CEGD was incorporated before finalizing the survey. The outcomes regarding fertility were discussed in de Nie et al. in 2023,[30] and the outcomes regarding gender identity and psychological functioning will be discussed in M. Arnoldussen et al. (accepted based on abstract).

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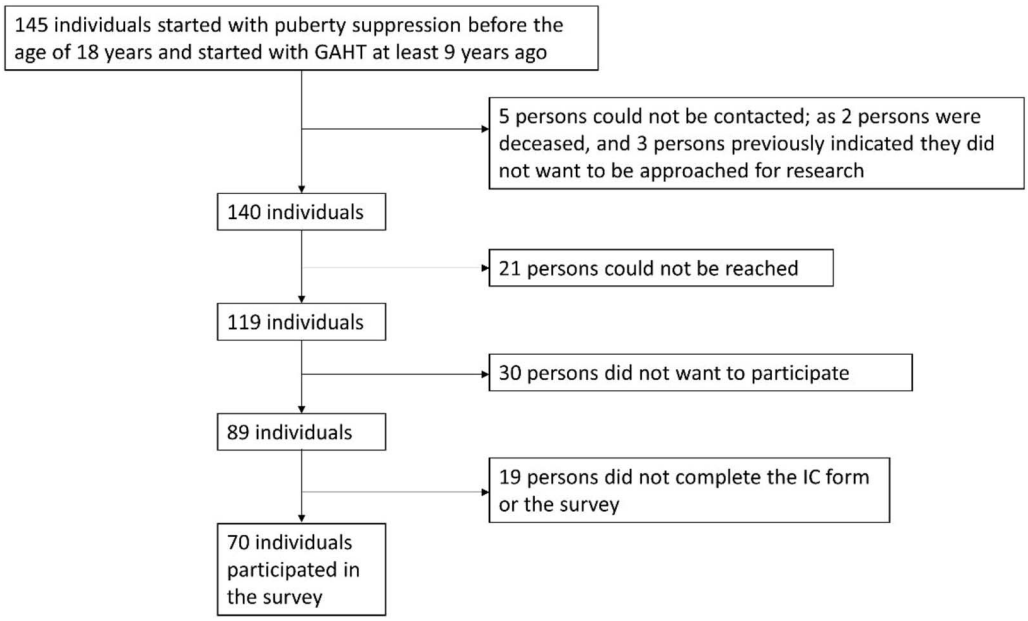
145 individuals started with puberty suppression before the age of 18 years and started with GAHT at least 9 years ago
5 persons could not be contacted; as 2 persons were deceased, and 3 persons previously indicated they did not want to be approached for research
140 individuals
21 persons could not be reached
119 individuals
30 persons did not want to participate
89 individuals
19 persons did not complete the IC form or the survey
70 individuals participated in the survey

Figure 1. Participant recruitment and participation.

Table 1. Characteristics of participants and non-participants.

Variable	Participants (N = 70)	Non-participants (N = 75)	Significance, *P*	Effect size[c]
Assigned sex at birth, *n* (%)[a]			*<.001*	0.34
Male	20 (29)	47 (63)		
Female	50 (71)	28 (37)		
Age at start PS, y[b]			.761	0.03
Median	14.7	14.6		
Range	11.5-18.0	11.6-17.9		
Age at start GAH, y[b]			.729	0.03
Median	16.1	16.2		
Range	13.9-18.5	14.0-19.0		

Abbreviations: GAH: gender-affirming hormones; PS: puberty suppression; y: years [a]Difference calculated by chi-square test [b]Differences calculated by Mann–Whitney *U* test [c]Effect sizes calculated using phi for categorical variables and *r* for continuous variables

Questions on relationships, sexual wellbeing, and sexual experiences were collected from existing (partly self-developed) questionnaires on sexuality previously used in our center,[15] the DSD-life study,[31] and in a large Dutch sexual health study in the general adolescent population.[32] The question on satisfaction with sex life originated from the World Health Organization Quality of Life—BREF Questionnaire (WHO-QOL-BREF) and asks, "How satisfied are you with your sex life?" with answer options ranging from 1 (very dissatisfied) to 5 (very satisfied).[33] For analytic purposes, we combined this in 1 and 2 (very dissatisfied and dissatisfied), 3 (neutral), and 4 and 5 (satisfied and very satisfied). Sexual activity with a partner (hereafter referred to as "sexual activity") was assessed with the question "Did you have sexual contact in the last 12 months with a partner?" with answer options ranging from "Not applicable, I do not have a sexual partner," "Not applicable, I did not have sexual activity with my partner in the past 12 months" to "nearly daily." We dichotomized sexual activity into more or less than once a month and reported on sexual inactivity (no sex in the last 12 months) separately. Sexual problems and experienced distress due to these problems were assessed using a selection of questions from a 15-item questionnaire based on Chapter 5 of the *Diagnostic Statistical Manual of Mental Disorders 4th edition, Text Revision* (DSM-IV-TR).[34,35] For each problem, individuals were asked whether they had ever experienced this problem (yes/no) and if they had experienced distress from this problem (yes/no). Sexual dysfunction was defined as an experienced problem with distress and was compared to function disturbances without distress. For some questions, participants could elaborate in a comment box; for example, they were asked for reasons for stopping GRMT or whether they thought sexual difficulties were linked to their gender identity. For all questions, participants had the option to answer "I prefer not to say."

Medical data were extracted from medical records, including Tanner stage and ages at start of 3 GRMT stages: PS, GAHT, and, if applicable, (g)GAS. In 2 participants (both assigned female at birth), the Tanner Stage at treatment initiation with puberty suppression was not stated in their medical records. As both were 17 years of age, and Tanner stage B4 is reached at approximately 13 years of age on average, these participants were grouped in the late puberty group.[36-38]

Analyses

For this study, a combination of descriptive and inferential statistics was used. Outcomes for transmasculine and transfeminine individuals were reported separately, followed by

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a comparison of early and late puberty suppression. For the latter, transmasculine and transfeminine individuals were grouped together if no differences in outcomes were anticipated due to differences in GRMT or in anatomy, such as for satisfaction with sex life or the importance of sex, and statistical analyses were performed. For the outcomes where it was necessary to report separately for transmasculine and transfeminine subgroups, for example, for sexual dysfunctions, descriptive statistics were used, as after dividing the cohort into gender subgroups and PS timing subgroups, conducting statistical analyses was not feasible due to the limited sample sizes.

Characteristics were reported as mean ± SD and range for normally distributed continuous variables, as median and range for non–normally distributed continuous variables, and frequencies and percentages for categorical variables. Kolmogorov–Smirnov test of normality was used to assess whether the data were normally distributed. To compare outcomes of group characteristics, sexual activity, importance of sex, and sexual satisfaction between early and late PS treatment groups, statistical analyses included independent *t*-tests for normally distributed continuous variables, Mann–Whitney *U* tests for non–normally distributed variables, and chi-square tests for categorical variables. If the assumptions of the chi-square test were not met, a 2-sided Fisher's exact test was used. Effect sizes were measured by Cohen's *d* for continuous variables, *r* for non–normally distributed continuous variables, and by phi for categorical variables. The prevalence of sexual dysfunctions in our cohort (all of whom started GRMT including PS before the age of 18) is described in comparison with findings from the European Network for the Investigation of Gender Incongruence cohort, consisting of 518 participants (59% assigned male at birth, 41% assigned female at birth) from 3 European gender clinics including our own, where participants started GRMT after the age of 17 and did not receive PS prior to GAHT.[26]

Results

Of the 70 participants (sociodemographic characteristics reported in Table 2), 50 were assigned female at birth (71%), of whom 48 identified as transgender men and 2 as (partly) non-binary transgender men. They were grouped together as transmasculine individuals. Twenty (29%) were assigned male at birth, of whom 19 identified as transgender women and 1 as woman/neutral/genderless. They were grouped together as transfeminine individuals.

As seen in Table 3, 17 participants (24%) initiated treatment with PS in early puberty and 53 (76%) participants in late puberty. PS treatment was on average initiated 14.3 years prior to study participation. All participants had started GAHT; at the time of the survey, 96% were still on GAHT. Reasons for stopping GAHT (n = 3) were a desire for pregnancy, inability to make an appointment, and no specific reason: "it gradually developed this way." Ninety percent of transmasculine individuals underwent a mastectomy, and 35% of transfeminine individuals had breast augmentation surgery. Forty-two percent of transmasculine individuals underwent gGAS (32% phalloplasty, 10% metadoioplasty), as did all but 1 of the transfeminine individuals (95% vaginoplasty). Fewer participants treated with early PS had breast surgery (mastectomy or breast augmentation) (35% vs 87%) [Fisher's exact (N = 70) $P < .001$, phi -0.505] and more underwent gGAS (82% vs 51%) [χ^2 (1, N = 70) = 5.83, $P = .016$, phi = 0.289] compared with late PS.

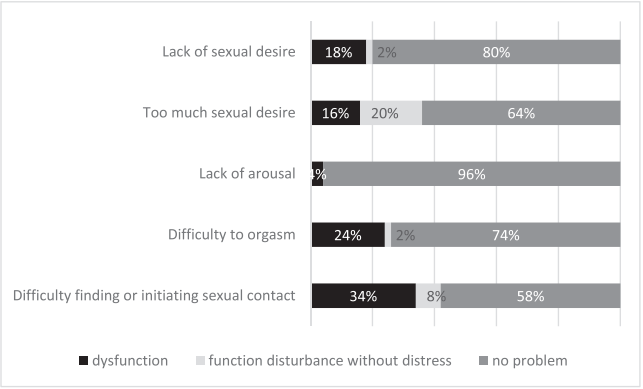

Figure 2. Sexual dysfunctions and function disturbances for transmasculine individuals (n = 50).

Sexual activity

Seventy-two percent of transmasculine individuals reported having had sex more than once a month in the last year. Transfeminine individuals were less sexually active, with 40% reporting having had sex more than once a month. Seventy-one percent of individuals treated with early PS reported having had sex more than once monthly versus 62% of the late PS group [χ^2 (1, n = 69) = 0.454, $P = .500$, phi = -0.081]. Twenty-two percent of transmasculine and 45% of transfeminine individuals were not sexually active with their partner or did not have a sexual partner. Sexual inactivity was equally reported by early (29%) and late PS (28%) groups [Fisher's exact (n = 69) $P = 1.000$, phi = 0.005].

Sexual satisfaction and importance of sex

Fifty-two percent of transmasculine individuals reported to be (very) satisfied with their sexual life, 20% reported neutrality, and 28% dissatisfaction. Of transfeminine individuals, 40% reported satisfaction versus 20% neutrality and 40% dissatisfaction. The majority of transmasculine individuals (92%) found sex to be moderate or very important, nexto to 70% of transfeminine individuals. Of the early PS group, 53% reported (high) sexual satisfaction versus 47% of the late PS group. Eighty-two percent of early PS reported moderate or high importance of sex versus 87% of the late group. Neither for satisfaction with sex life [Fisher's exact (n = 51) $P = .297$, phi = -0.17] nor for importance of sex [χ^2 (1, N = 70) 4.56, $P = .103$, phi = 0.26] were there significant differences between the early and late PS groups.

Sexual dysfunction in transmasculine individuals

As seen in Figure 2, most types of dysfunctions were reported by a minority of transmasculine individuals. Fifty-eight percent of transmasculine individuals reported having experienced at least one sexual dysfunction, of which the most common was difficulty with finding or initiating sexual contact (34%). Sexual dysfunctions were reported more often than function disturbances without distress, indicating that most sexual problems were accompanied by distress. Sixty-seven percent (n = 6) of transmasculine participants with early puberty suppression reported to have experienced at least one sexual dysfunction versus 56% (n = 23) of those with late PS.

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Table 2. Sample characteristics of the participants.

Variable	All participants (N = 70)	Transmasculine individuals (n = 50)	Transfeminine individuals (n = 20)
Age at study assessment, *y*			
Mean (SD)	29.1 (2.4)	29.1 (2.3)	29.1 (2.7)
Range	25.7-36.3	25.7-33.5	25.7-36.3
Civil status, *n* (%)			
Single	42 (60)	30 (60)	12 (60)
Living together	16 (23)	11 (22)	5 (25)
Married	11 (16)	8 (16)	3 (15)
Other[a]	1 (1)	1 (2)	0 (0)
Educational level[b], *n* (%)			
Low	1 (1)	1 (2)	0 (0)
Intermediate	46 (66)	31 (62)	15 (75)
High	23 (33)	18 (36)	5 (25
Employment[c]	64 (91)	46 (92)	18 (90)
Sexual orientation, *n* (%)			
Heterosexual	46 (66)	31 (62)	15 (75)
Homosexual	4 (6)	4 (8)	0 (0)
Bisexual	14 (20)	11 (22)	3 (15)
Other[d]	6 (8)	4 (8)	2 (10)
Duration of longest relationship, *mo*			
Median	6	5	7
Range	0-71	0-55	1-71
Treatment group, *n* (%)			
Early PS	17 (24)	9 (18)	8 (40)
Late PS	53 (76)	41 (82)	12 (60)
Technique of gGAS, n (%)			
Vaginoplasty	19 (27)	n/a	19 (95)
Metadoioplasty	5 (7)	5 (10)	n/a
Phalloplasty	16 (23)	16 (32)	n/a
No gGAS	30 (43)	29 (58)	1 (5)

Abbreviations: gGAS: genital gender-affirming surgery; PS: puberty suppression; mo: months; y: years; n/a, non-applicable. [a]Other civil status: engaged but postponed wedding due to COVID-19. [b]Low includes lower education and lower vocational school; intermediate includes secondary education and secondary vocational or high school; high includes higher vocational school or bachelor, master, or doctorate degree. [c]Full-time and part-time employment and education. [d]Other sexual orientations consist of: "can't/won't say sexual orientation" (n = 3), "asexual/straight" (n = 1), "asexual" (n = 1), and "attracted to humans" (n = 1).

Table 3. Treatment group characteristics.

Variable	All participants (N = 70)	Early PS (n = 17)	Late PS (n = 53)	Significance, *P*	Effect size[e]
Tanner (B/G) stage at start PS, *n* (%)				n/a	n/a
Tanner stage 2	5 (7)	5 (29)			
Tanner stage 3	12 (17)	12 (71)			
Tanner stage 4	15 (21)		15 (28)		
Tanner stage 5	36 (51)		36 (68)		
Tanner stage unknown	2 (3)		2 (4)		
Age at start PS, *y*[a]				*0.038*	*-0.230*
Mean (SD)	14.8 (1.9)	13.1 (1.2)	15.4 (1.7)		
Range	10.9– 17.97	10.9-15.6	11.9-17.97		
Age at start GAH, *y*[b]				0.059	0.23
Median	16.2	16.0	16.4		
Range	13.9-18.5	15.96-17.6	13.9-18.5		
Age at gGAS, *y*[b]				0.349	0.15
Median	21.1	19.8	21.3		
Range	18.1– 28.7	18.6-24.5	18.1-28.7		
Time since gGAS, *y*[a]				0.299	0.20
Mean (SD)	7.8 (3.7)	8.3 (4.3)	7.5 (3.5)		
Range	1.7-16.3	2.0-16.3	1.7-15.3		
Breast surgery, *n* (%)[c,*]	52 (74)	6 (35)	46 (87)	*<.001*	-0.51
gGAS, *n* (%)[d]	40 (57)	14 (82)	27 (51)	*0.016*	0.29

Abbreviations: GAH: gender-affirming hormones; gGAS: genital gender-affirming surgery; PS: puberty suppression; y: years; n/a: non-applicable. [a]Differences calculated by *t*-test. [b]Differences calculated by Mann–Whitney *U* test. [c]Differences calculated by Fisher exact test. [d]Differences calculated by chi-square test. [e]Effect sizes calculated using phi for categorical variables, Cohen's *d* for normally distributed continuous variables, and *r* for non-normally distributed continuous variables. *Breast surgery was either a mastectomy (transmasculine individuals) or breast augmentation (transfeminine individuals).

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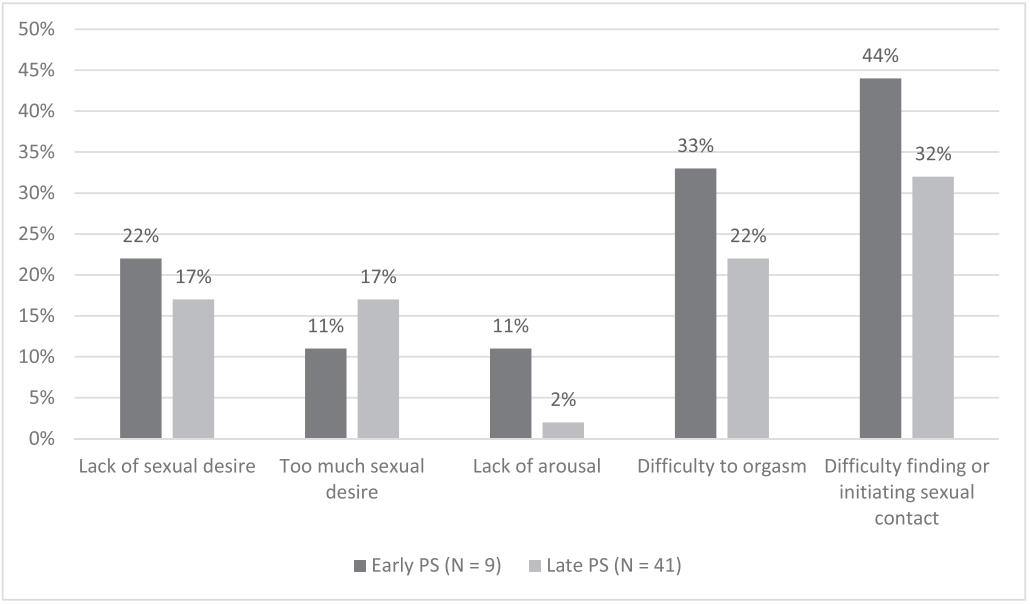

Figure 3. Sexual dysfunctions among treatment groups* for transmasculine individuals (n = 50). *Early PS: started puberty suppression at Tanner stage B2/3, late PS: started at Tanner stage B4/5.

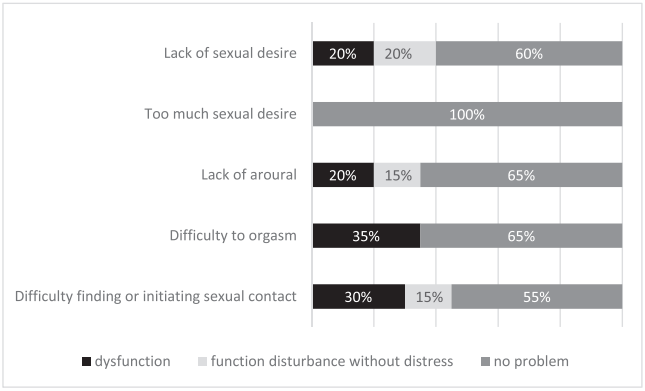

Figure 4. Sexual dysfunctions and function disturbances for transfeminine individuals (n = 20).

Sexual dysfunction prevalence was fairly similar between the early and late PS group (Figure 3).

Sexual dysfunction in transfeminine individuals

Most sexual dysfunctions were reported by a minority of transfeminine individuals, as shown in Figure 4. Fifty percent reported having experienced at least one sexual dysfunction, with difficulty to orgasm being reported the most (n = 7, 35%). The prevalence of sexual dysfunctions in transfeminine individuals was similar to or higher than the prevalence of function disturbances without distress. The largest dissimilarities in sexual dysfunction between those that started with PS in early puberty compared with those treated in later puberty were lack of arousal and difficulty to orgasm, which were only reported by 4 and 7 individuals, respectively, in the late PS group (Figure 5).

Comparing outcomes of treatment with PS from adolescence to GRMT from adult age

When comparing our cohort that started GRMT in adolescence with findings from a cohort that started GRMT in adulthood,[26] we found similar prevalences of sexual dysfunctions between the cohort treated with PS and the cohort that started GRMT at an adult age (see Table 4).

Qualitative comments on sexual problems

Participants were asked if they thought that their sexual problems were linked to being TGD. To this question, 27% answered "yes" and 33% "partly." Participants were offered the opportunity to elaborate on this in an open text box. The topics mentioned most often were dissatisfaction with aesthetic or functional results of their genitalia after gGAS (n = 14), experiencing limitations because of self-confidence or body image issues (n = 11), or challenges in finding sexual partners (n = 8). A selection of quotes can be found in Table 5.

Discussion

This retrospective cohort study explored sexual satisfaction and sexual dysfunctions in TGD individuals treated with PS from early puberty onwards (having experienced limited endogenous puberty) and in late puberty (after (partial) endogenous puberty), with PS treatment being initiated, on average, 14 years prior to study participation. The majority of this sample (71%) were sexually active in the last year and found sex to be moderately or very important. Around half were sexually satisfied, and most sexual dysfunctions were reported by a minority of participants (11-33%). Frequency of sexual activity, satisfaction with sex life, and importance of sex appear to be similar between the groups who started treatment in early and late puberty. Thus, in contrast to what is hypothesized based on the literature, suppressing endogenous puberty early does not seem to result in an increased risk of sexual dysfunctions in this group, as prevalence rates in early and late PS groups are fairly similar (47% vs 59% experienced dysfunction). In transfeminine individuals, some problems are only reported in the late PS group (lack of arousal and difficulty to orgasm). Prevalence rates of sexual dysfunction also appear to be similar to those reported in

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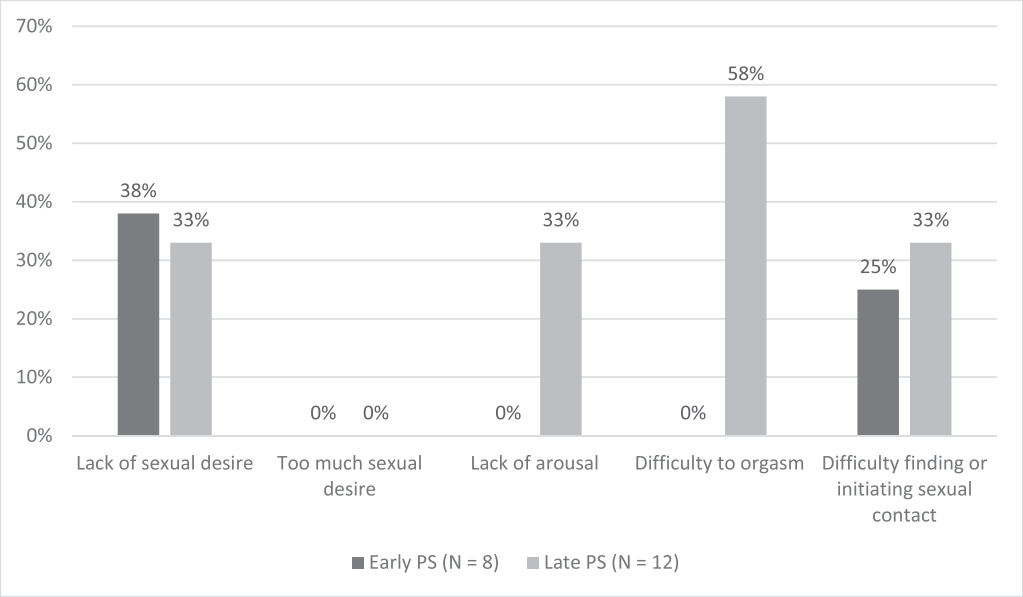

Figure 5. Sexual dysfunctions among treatment groups∗ for transfeminine individuals (n = 20). ∗Early PS: started puberty suppression at Tanner stage G2/3, late PS: started at Tanner stage G4/5.

Table 4. Comparing sexual dysfunction in TGD individuals with early GRMT initiation with PS in adolescence versus initiation with GRMT with GAH at an adult age.

	Transmasculine individuals		Transfeminine individuals	
	Proportion of PS cohort (observed proportion) (n = *50*)	Proportion of GRMT at adult age cohort[26] (test proportion) (n = 189)	Proportion PS cohort (observed proportion) (n = 20)	Proportion GRMT at adult age cohort[26] (test proportion) (n = 246)
Lack of sexual desire	0.18	0.09	0.20	0.20
Too much sexual desire	0.16	0.14	0.00	0.06
Lack of arousal	0.04	0.10	0.20	0.20
Difficulty to orgasm	0.24	0.15	0.35	0.29
Difficulty finding or initiating sexual contact	0.34	0.32	0.30	0.26

Abbreviations: GAH: gender-affirming hormones; GRMT: gender-related medical treatment; PS: puberty suppression; TGD: transgender and gender diverse.

TGD individuals who started GRMT in adulthood and went through full endogenous puberty. This descriptive comparison suggests that PS prior to GAHT does not have negative effects on sexual wellbeing compared to GRMT started in adulthood.

Sexual activity

In this sample of TGD adults who started GRMT during adolescence, 28% reported no sexual activity in the last year, which is higher than in the cisgender population but lower than in the transgender population that received GRMT without prior PS. In cisgender participants in studies in Belgium and the Netherlands, 15% and 22.5% were not sexually active in the last 6 months.[39,40] Nikkelen and Kreukels studied sexual behaviour among TGD people with different treatment desires and found that 33-55% of the participants treated in adulthood with a fulfilled treatment desire were not sexually active in the last 6 months.[41] Participants in this study reported that factors contributing to sexual inactivity may include challenges in forming sexual connections, low body confidence, or dissatisfaction with gGAS results.

Sexual satisfaction

We found no significant differences for sexual satisfaction in our cohort between the early and late PS groups (53% versus 47%). Satisfaction was comparable to or slightly higher than in other TGD cohorts where treatment began in adulthood. Studies on sexual satisfaction in TGD individuals show a wide range of satisfaction rates. An Australian study found that 32% of transgender participants were sexually satisfied,[42] and a Dutch study found that 27-35% of transfeminine individuals and 32-39% of transmasculine individuals were satisfied.[41] However, these studies include participants in all stages of GRMT, and most studies reporting on sexual satisfaction after GRMT show higher satisfaction rates compared to pre-GRMT. Systematic reviews found that 64-76% of transmasculine individuals were (very) satisfied after GAS[21] and 64-98% of the transfeminine individuals after vaginoplasty.[43] Having a fulfilled treatment desire can be an important factor in sexual wellbeing,[41] and sexual activities and satisfaction often increase after GRMT.[15,44] In this study, less than half of the transmasculine individuals had had surgery, and some may still have a wish for gGAS, which may be related to lower satisfaction with their current sex life. In this and other studies reported reasons for sexual dissatisfaction in TGD individuals include not having a sexual partner, mental health problems, genital dissatisfaction, or a negative body image.[41,42,45,46] Sexual satisfaction in this TGD cohort (49%) appears similar to the cisgender population, where sexual satisfaction was

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Table 5. Participant perspectives on transgender identity and sexual problems.

Can you explain why there are problems in your sex life that may be related to being transgender?[a]	
Themes	*Supporting quotes*
Dissatisfaction with function of genital after gGAS *(n = 14)*	My penis is so small that it is very difficult to have sex. (TM, 28y, late PS) I am very dissatisfied with the results of the surgery which makes it difficult for me to have sex on a physical level (shallow vagina and pain) but mainly on a psychological level because it doesn't look like a real vagina so I don't feel feminine enough. (TF, 33y, late PS) My vagina is way too narrow and the entrance is blocked from the inside (TF, 36y, early PS)
Confidence and body image *(n = 11)*[b]	I have always been afraid that people cannot really find my body sexually very arousing. I can enjoy sex just fine. But I haven't been able to have an orgasm with a partner present. I haven't gained enough confidence for this yet. (TF, 33y, late PS) I have difficulty accepting my own body, which is why sexual contact can also be very confronting. (TM, 26y, late PS) Because I find it hard to accept that I don't have a "normal" penis. (TM, 33y, early PS)
Difficulty finding/initiating sexual contact *(n = 8)*	It is not always easy to find a person who is open to having sex with a transgender person. In addition, it is also not always easy to expose yourself to someone who is actually unfamiliar with it. (TM, 27y, late PS) Unfortunately, as soon as I tell them that I am a trans woman, they are no longer interested. (TF, 29y, late PS) It certainly is not always a problem, but rejection because I am "different" does make me less likely to seek contact out of fear that my otherness will not be accepted. (TM, 32y, late PS)
No (complete) genital gender-affirming surgery *(n = 6)*	Although I was accepted by my ex-partners with the genital I still have now, I can still be insecure about it myself. I can be scared that my partners would prefer a penis after all. (TM, 28y, late PS) I did not have a genital gender affirming surgery. Because of this you start a relationship with a lot of openness. I experience people being very afraid of the outside world and therefore not moving towards intimacy. (TM, 27y, early PS) I am not completely comfortable with my current penis without an erection prosthesis. My partner does not find this a problem and does not need penetration, but I want to be able to penetrate and do not feel completely "finished" without the prosthesis. (TM, 31y, late PS)
Having a transgender identity *(n = 5)*	I think the sex life of a cis man really is 100% easier, and if I had been a cis man myself, I would have had more and easier sex with others. (TM, 26y, late PS) I am hesitant to relax with a new sex partner. This also has to do with the fact that I don't tell (new) partners that I am trans. Not even before sex. (TM, 27y, early PS) I can't just have a one-night stand, for example. I always have to tell something first. (TM, 33y, late PS)

Abbreviations: PS: puberty suppression; gGAS: genital gender-affirming surgery; TM: transmasculine; TF: transfeminine; y: years. [a] n = 42 participants filled in the open box. [b] 58% did not have gGAS (yet).

found in 47% in a general population sample[33] and for 55% and 45% of sexually active men and women.[47]

The majority of transmasculine individuals (92%) found sex to be moderately or very important, compared with 70% of transfeminine individuals, with no statistical differences between individuals treated with early versus late PS. This is higher than found in the general population, where a high importance of sexual health was reported by 50% of sexually active men and 40% of sexually active women.[47] This could be related to an increased sexual focus, as TGD individuals often engage in conversations and decisions about their bodies and sexual health during their medical and social transitioning processes.

Sexual dysfunction

All sexual dysfunctions were reported more frequently as absent than present, indicating that the majority of participants experienced no issues with desire, arousal, or achieving orgasm. Sexual dysfunctions were similar in early and late PS groups (47% vs 59%). In transfeminine individuals, lack of arousal and difficulty achieving orgasm were reported solely in the late PS group; however, the early PS group consisted of only 8 participants. In an earlier study, no difference was found between early and late PS groups in the occurrence of sexual problems in transfeminine individuals.[29] Another explanation for a lower report of some sexual dysfunctions in the early PS group and, for the higher sexual satisfaction in those treated with PS in adolescence versus those starting GRMT in adulthood, could be that (early) GRMT may contribute to improved mental health, enhanced overall wellbeing, and greater body satisfaction,[48-50] which may consequently lead to better sexual functioning in adulthood.[41,42,45,46]

The prevalence of experienced sexual dysfunctions in this sample appears comparable with that in transgender adults who started GRMT in adulthood and had full endogenous puberty.[26] Kerckhof et al. found that 54% of sexually active transmasculine individuals and 69% of transfeminine individuals treated in adulthood (without PS) reported at least one sexual difficulty.[26] However, various GRMT trajectories differed between the cohorts, limiting comparability. Previous research by our center found that 67% of post-vaginoplasty transfeminine individuals treated with PS experienced sexual difficulties regularly.[29] The lower prevalence in this study (50%) is most likely due to our differentiation between functional disturbances with and without distress, or possibly because more time has passed since gGAS, allowing more adaptation and recovery. Sexual dysfunction is also commonly observed among cisgender individuals, with prevalence rates of up to 42% in young women in the Netherlands and 43% in adult women in the United States (US).[51,52] In adult men in the US and England, 31% and 34% reported sexual dysfunction.[51,53] A possible explanation for the higher percentages in this transgender sample could be feelings of shame or physical discomfort, which was previously reported by around half of transfeminine individuals[29] and was also stated as a possible reason for sexual dysfunction by individuals in this study. This aligns with the biopsychosocial model, explaining that sexual wellbeing is not only determined by physical factors, like medical treatment or physical characteristics, but also influenced by multiple other factors.[54,55] For instance, 18% of transmasculine individuals reported low sexual desire,

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despite testosterone typically increasing desire.[56] This suggests that other factors, for example, body image, mental health, and relationship dynamics, likely contribute to sexual dysfunction,[41,57-59] with our participants also reporting some of these as underlying causes of their sexual difficulties. It is important to recognize that TGD individuals may have different goals and expectations regarding sexual health compared to cisgender individuals and that sexological healthcare should be tailored specifically to the TGD population.[21]

Strengths and limitations

Although this is the first study describing sexual satisfaction and dysfunction in TGD individuals treated with PS, there are limitations to consider when interpreting these results. The limited sample size, especially among transfeminine individuals, did not allow statistical analyses for comparing treatment groups by gender with adjustment for potential confounding factors, limiting the generalizability of these findings. In addition, we did not have information on body satisfaction and the fulfilment of GRMT desires, factors previously identified as predictors of sexual satisfaction.[41] We also do not have data on reasons for starting treatment at different stages of puberty, nor on psychological functioning and onset of gender dysphoria, which may be important because, later, referred TGD adolescents report more mental health problems.[60] With an average follow-up of 14 years post-PS, this study provides a unique long-term perspective; however, the extended timeframe introduces the possibility that additional factors influencing sexual wellbeing may have played a role. For instance, changes in relationship status or sexological support over time could have affected outcomes, but the lack of data on these factors limits our ability to fully evaluate their impact. Additionally, the long follow-up period increases the risk of recall bias, potentially affecting the accuracy of self-reported experiences. Furthermore, the question regarding sexual dysfunction did not specify whether these issues occurred before or after GRMT, highlighting the need for long-term follow-up studies with multiple measurement points. However, TGD individuals often delay sexual experiences until after GRMT and seem to reach certain sexual milestones later than their cisgender counterparts.[15] The responses related to sexuality therefore more likely reflect experiences occurring after the completion of GRMT, closer to the time the questionnaire was completed. Additionally, by analyzing only the occurrence rather than the intensity or frequency of difficulties, the reported data also encompassed individuals experiencing these difficulties mildly or occasionally, which may have led to overestimation compared to studies that consider only regular problems. Certain questions (eg, sexual activity) were framed specifically in terms of sex with a partner, overlooking the role of masturbation, which can be a significant aspect of sexual behavior and satisfaction. Given that the majority of this sample is single, it is crucial to also consider individuals who do not engage in or seek partnered sex or those who are satisfied with solo sexual activity or remaining celibate. Unique to this study is the distinction between experiencing dysfunctions and distress, as experiencing a dysfunction does not always equal distress.[26,61]

Clinical implications and further research

These data can facilitate better informed counselling regarding later sexual functioning for TGD adolescents considering PS treatment. The prevalence of sexual dysfunction in those who used PS appears comparable to that among those who began GRMT in adulthood and cisgender individuals. However, a significant number of TGD individuals still experience sexual dysfunction, warranting ongoing focus on exploring explanations for this, both in counseling in gender healthcare and in future research.[46,62] Given that difficulties in seeking and initiating sexual contact are among the most frequently reported sexual challenges in this sample, factors that do not seem directly linked to the physical effects of GRMT, it is important to address these psychosocial issues and provide counseling focused on these challenges. Sexual experiences are inherently complex and necessitate a biopsychosocial approach in both research and clinical settings, especially since the majority of TGD individuals report to find sex (very) important.[63-65] Further research should also focus on positive sexual experiences, pleasure, and quality of sex life,[46] especially in TGD individuals treated with PS, as there has been minimal research on sexual wellbeing of those who did not go through complete endogenous puberty.

Conclusion

This study explored sexual wellbeing among TGD adults who underwent PS during early or late puberty, with PS treatment initiated an average of 14 years prior to participation. The majority of participants experienced no issues with desire, arousal, or achieving orgasm. Outcomes on satisfaction and dysfunction were similar in both treatment groups and comparable to those who initiated GRMT in adulthood. Sexual satisfaction was comparable to the general population. These outcomes may help to alleviate concerns regarding the long-term sexual outcomes for TGD individuals who did not complete endogenous puberty before starting GRMT. However, it remains essential to address sexual wellbeing within transgender healthcare settings and to explore the factors contributing to optimal sexual wellbeing.

Author contributions

I.S.v.d.M. (MD, PhD candidate) conceptualized and designed the study, collected data, planned and conducted the analyses, interpreted data, and wrote the manuscript; M.A. (MD, PhD candidate) conceptualized and designed the initial study, collected data, and reviewed the manuscript; A.I.R.v.d.M. (MD, PhD) assisted in conducting the analyses, data interpretation, and reviewed the manuscript; S.E.H. (MD, PhD), conceptualized and designed the study, assisted with data interpretation, and reviewed the manuscript; T.D.S. (PhD) conceptualized and designed the study, supervised data collection, assisted with data interpretation, and reviewed the manuscript; A.L.C.d.V. (MD, PhD) conceptualized and designed the study, supervised data collection, assisted with data interpretation, and reviewed the manuscript; B.P.C.K. (PhD) conceptualized and designed the study, assisted in conducting the analyses, assisted with data interpretation, and reviewed the manuscript as lead supervisor; All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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Conflicts of interest

The authors have no conflicts of interest relevant to this article to disclose.

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